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on the left-hand side of this equation is $G^2a^6(27J^2 - I^3) = G^2a^6\Delta$, where Δ is the discriminant of the biquadratic under discussion. This proves the theorem proposed. It is of course understood that G^2 is *different* from zero.

To continue the discussion further under the preceding Question, write the right-hand side of the above expression in the form

$$F_1(x)[C_0x^2 + C_1x + C_2] + F(x)\Phi(x).$$

It may be shown that

$$\begin{aligned} C_0 &= 9HG^2 - 9\lambda H^2 + \lambda^2 = 9HG^2 + (3H^2 - a^2I)\lambda = (a^2I)^2 - 6H^2a^2I - 9Ha^3J, \\ C_1 &= 3[3a^3Ja^2I + 2G^2a^2I - H(a^2I)^2 - 18H^2a^3J] \\ &= 3[6H^2G^2 + \lambda(G^2 + 2H\lambda - 18H^3)] \\ &= 3[a^3Ja^2I + H(a^2I)^2 - 8H^3a^2I - 18H^2a^3J], \\ C_2 &= 9(G^4 - \lambda^2H^2) + \lambda^3 + 12G^2\lambda H - 18HG^2a^2I \\ &= a^6\Delta + 6G^2(3a^3J + Ha^2I). \end{aligned}$$

Writing $x = 2e_1$ in the expression above and noting that $F(2e_1) = 0$, it is seen that

$$\frac{1}{8e_1^3 + 12He_1^2 + G^2} = \frac{4C_0e_1^2 + 2C_1e_1 + C_2}{G^2a^6\Delta}.$$

Returning to the integral relations in the preceding Question it is seen that

$$\begin{aligned} G^2a^6\Delta\tau &= B_0\sigma^3 + B_1\sigma^2 + B_2\sigma + B_3, \\ G^2a^6\Delta\sigma &= B_0\tau^3 + B_1\tau^2 + B_2\tau + B_3, \end{aligned}$$

where the B's are integral functions of the second degree in e_1. The coefficients of these latter functions are integral in H, G^2 and I. Writing for σ, τ the values z_0, z_1, z_2, z_3 and interchanging e_1 with e_2 and e_3, we have here six pairs of integral relations corresponding to the rational relations indicated in 5.

The last part of 5 follows from the first part by use of 4.

NOTE. To Question 36, proposed by Professor Hancock, his own reply, printed above, is the only one as yet received. A reply to part 1 of the question will be welcome.—EDITOR.

DISCUSSIONS.

We present this month two discussions, both related more closely to secondary than to collegiate mathematics, but of considerable interest also to teachers of the latter. Professor Johnson, in advocating, with much reason, the early use of the complex number and its representation by a point of the plane, has made several comments on which there may well be differences of opinion. It is hoped that expressions on such questions will be forthcoming from readers.

Professor McClenon states without argument certain modes of approaching the teaching of logarithms. Many, perhaps most, teachers will be able to express a preference regarding these diverse methods, without hesitation.

I. THE COMPLEX QUANTITY IN ELEMENTARY ALGEBRA.

By W. WOOLSEY JOHNSON, U. S. Naval Academy.

It is the purpose of this note to advocate an earlier introduction, to the student of elementary algebra, of the geometrical interpretation of the complex quantity $a + bi$ (Argand's diagram) than seems usually to be made.